

REMARKS

In the last Office Action, the Examiner rejected claims 1, 3, 4 and 24-35 under 35 U.S.C. §102(b) as being anticipated by European Patent Application No. EP 0 797 117 A1 to Muramatsu. Claims 36, 37 and 40 were rejected under 35 U.S.C. §103(a) as being unpatentable over Muramatsu. Claims 38 and 39 were rejected under 35 U.S.C. §103(a) as being unpatentable over Muramatsu in view of Niwa.

In accordance with the present response, independent claims 1 and 34 have been amended to further patentably distinguish from the prior art of record by incorporating the subject matter of claims 4 and 35, respectively, directed to the first and second sides of the optical waveguide and to the reflecting film. Claim 35 has been further amended to incorporate the subject matter of claim 36 which requires that the reflecting member forms part of the reflecting film. Claim 1 has also been amended in a similar manner to claim 35 to recite that the reflecting member forms part of the reflecting film. Independent claim 40 has been amended in a manner similar to claims 1 and 35 to recite the first and second sides of the optical waveguide, the reflecting film, and that the reflecting member forms part of the reflecting film. Dependent claims 4, 27, 29, 31, 33 and 35 have been amended in light of the amendments to claims 1 and 35, respectively. Claims 36 and 39 have been canceled. A new

abstract which more clearly reflects the invention to which the amended claims are directed has been substituted for the previously submitted abstract.

The amendments to the abstract and claims made herein do not raise new issues requiring further search and/or consideration. Instead, independent claims 1 and 34 have been amended to further patentably distinguish from the prior art of record by incorporating part of the subject matter of claims 4 and 35, respectively, and to recite the structural relationship between the reflecting member and the reflecting film recited in claim 36, independent claim 40 has been amended in a manner similar to claims 1 and 35, dependent claims 4, 27, 29, 31, 33 and 35 have been amended in light of the amendments to claims 1 and 35, respectively, claims 36 and 39 have been canceled, and a new abstract which more clearly reflects the invention to which the amended claims are directed has been substituted for the previously submitted abstract, thereby placing the application in condition for allowance or otherwise substantially reducing the issues which remain for appeal.

Applicants respectfully request reconsideration of their application in light of the following discussion.

Brief Summary of the Invention

The present invention is directed to an optical microcantilever.

Fig. 13 shows a conventional optical microcantilever. As described in the specification (pgs. 3-4), the conventional optical microcantilever shown in Fig. 13 has not been able to prevent the high loss of propagating light occurring in the optical waveguide. The loss of propagating light diminishes the ability of the optical microcantilever to propagate light efficiently toward the microscopic aperture formed at the tip of the optical waveguide. This results in the inability to generate near-field light at the microscopic aperture.

The present invention overcomes the drawbacks of the conventional art. Fig. 1 shows an embodiment of an optical microcantilever 10 according to the present invention embodied in the claims. The optical microcantilever 10 comprises an optical waveguide 2 for propagating light and has a light input/output end 8, a free end, a first side (lower side in Fig. 1), and a second side (upper side in Fig. 1) opposite the first side. A tip 5 is formed on the first side and at the free end of the optical waveguide 2 and has a microscopic aperture 6. A reflecting film 4 is disposed on the second side of the optical waveguide 2. According to the present invention, a reflecting member 7 (e.g., a mirror) forms part

of the reflecting film 4 and is disposed at the free end of the optical waveguide 2. The reflecting member 7 has a generally planar surface for reflecting light propagated by the optical waveguide 2 and for guiding the reflected light towards the microscopic aperture 6 of the tip 5.

By the foregoing construction, the propagating light propagated by the optical waveguide is effectively guided by the reflecting member towards the microscopic aperture in the tip of the optical microcantilever so that sufficient near-field light is generated at the microscopic aperture.

Traversal of Prior art Rejections

Rejection Under 35 U.S.C. §102(b)

Claims 1, 3-4 and 24-35 were rejected under 35 U.S.C. §102(b) as being anticipated by Muramatsu. Applicants respectfully traverse this rejection and submit that amended independent claims 1 and 34 and dependent claims 3-4, 24-33 and 35-35 recite subject matter which is not identically disclosed or described in Muramatsu.

Amended independent claim 1 is directed to an optical microcantilever for a scanning near field microscope and requires an optical waveguide having a light input/output end, a free end for propagating light incident from the light input/output end, a first side, and a second side opposite to the first side. Amended claim 1 further requires a tip formed

on the first side and at the free end of the optical waveguide and having a microscopic aperture, a reflecting film disposed on the second side of the optical waveguide, and a reflecting member forming part of the reflecting film and disposed at the free end of the optical waveguide, the reflecting member having a generally planar surface for reflecting light propagated from the light input/output end of the optical waveguide and for guiding the reflected light towards the microscopic aperture of the tip, or for reflecting light propagated from the microscopic aperture towards the light input/output end of the optical waveguide. No corresponding structural combination is disclosed or described by Muramatsu.

Amended independent claim 34 is also directed to an optical microcantilever and requires an optical waveguide for propagating light and having a first side, a second side opposite to the first side, and a tip portion formed on the first side and at a free end of the optical waveguide, the tip portion having a microscopic aperture. Amended claim 34 further requires a reflecting film disposed on the second side of the optical waveguide, and a reflecting member forming part of the reflecting film and disposed at the free end of the optical waveguide, the reflecting member having a generally planar surface for reflecting light propagated by the optical waveguide and for guiding the reflected light towards the microscopic aperture to generate near-field light at the

microscopic aperture. Again, no corresponding structural combination is disclosed or described by Muramatsu.

Muramatsu discloses an optical waveguide probe and optical system. In one embodiment shown in Fig. 2(f), the optical waveguide probe has a substrate portion 2, an optical waveguide portion 8 formed in the substrate portion 2, and a mirror (reflecting member) 30 for changing the direction of light transmitted by the optical waveguide portion 8. However, the optical waveguide probe in the embodiment of Fig. 2(d) does not have a reflecting film disposed on the second side of the optical waveguide such that the reflecting member forms part of the reflecting film, as required by each of amended independent claims 1 and 34.

In another embodiment shown in Fig. 9(a) of Muramatsu, the optical waveguide probe has a substrate 2 and a reflecting film 24 disposed on a side of the substrate 2. However, the optical waveguide probe of Fig. 9(a) does not have a reflecting member forming part of the reflecting film, and further that the reflecting member has a generally planar surface for reflecting light propagated from the light input/output end of the optical waveguide and for guiding the reflected light towards the microscopic aperture of the tip, or for reflecting light propagated from the microscopic aperture towards the light input/output end of the optical

waveguide, as required by each of amended independent claims 1 and 34.

In the absence of the foregoing disclosure recited in amended independent claims 1 and 34, anticipation cannot be found. See, e.g., W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) ("Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration"); Continental Can Co. USA v. Monsanto Co., 20 USPQ2d 1746, 1748 (Fed. Cir. 1991) ("When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found."); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added) ("Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim").

Stated otherwise, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. This standard is clearly not satisfied by Muramatsu for the reasons stated above. Furthermore, Muramatsu does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to

modify Muramatsu's optical waveguide probe to arrive at the claimed invention.

Claims 3-4, 24-33 and 35-35 depend on and contain all of the limitations of amended independent claims 1 and 34, respectively, and, therefore, distinguish from the references at least in the same manner as claims 1 and 34.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 3, 4 and 24-35 under 35 U.S.C. §102(b) as being anticipated by Muramatsu be withdrawn.

Rejections Under 35 U.S.C. §103(a)

Claims 37 and 40 were rejected under 35 U.S.C. §103(a) as being unpatentable over Muramatsu. Applicants respectfully traverse this rejection and submit that the teachings of Muramatsu do not disclose or suggest the subject matter recited in claims 37 and 40.

Muramatsu does not disclose or suggest the subject matter recited in amended independent claim 34 as set forth above for the rejection of claims 1, 3, 4 and 24-35 under 35 U.S.C. §102(b). Claim 37 depends on and contains all of the limitations of amended independent claim 34 and, therefore, distinguishes from Muramatsu at least in the same manner as claim 34.

Amended independent claim 40 is directed to an optical microcantilever and requires an optical waveguide for propagating light and having a longitudinal axis, a first side, a second side opposite to the first side, and a tip portion formed on the first side and at a free end of the optical waveguide, the tip portion having a microscopic aperture. Amended claim 40 further requires a reflecting film disposed on the second side of the optical waveguide, and a reflecting member forming part of the reflecting film and being disposed on at least a portion of the optical waveguide, the reflecting member having a generally planar surface disposed proximate the free end of the optical waveguide at a preselected angle relative to the longitudinal axis for reflecting light propagated by the optical waveguide and for guiding the reflected light towards the microscopic aperture to generate near-field light at the microscopic aperture. Again, no corresponding structural combination is disclosed or described by Muramatsu.

Thus amended independent claim 40 requires a reflecting film disposed on the second side of the optical waveguide, and a reflecting member forming part of the reflecting film and being disposed on at least a portion of the optical waveguide, the reflecting member having a generally planar surface disposed proximate the free end of the optical waveguide at a preselected angle relative to the

longitudinal axis for reflecting light propagated by the optical waveguide and for guiding the reflected light towards the microscopic aperture to generate near-field light at the microscopic aperture. Muramatsu does not disclose or suggest the structural combination of the reflecting film and the reflecting member and corresponding function recited in amended claim 40 as set forth above for amended independent claims 1 and 34.

Moreover, the feature of the reflecting member forming part of the reflecting film recited in amended independent claim 40 corresponds to the subject matter of claim 36, which has been canceled. With respect to this feature, the Examiner contends that it would have been obvious to one of ordinary skill in the art to modify the optical waveguide probe of Muramatsu to "make the reflecting member part of the reflecting film" in order to reduce the number of components of the optical waveguide probe. Applicants respectfully disagree with the Examiner's contention.

First, applicants respectfully submit that none of the embodiments of the optical waveguide probe disclosed by Muramatsu has both a reflecting film and a reflecting member, as required by independent claim 40. More specifically, in the embodiment shown in Fig. 2(f) of Muramatsu, the optical waveguide probe has a mirror (reflecting member) 30 for changing the direction of light transmitted by an optical

waveguide portion 8, but does not have, in addition to the reflecting member, a reflecting film disposed on a side of the optical waveguide. In the embodiment shown in Fig. 9(a) of Muramatsu, the optical waveguide probe has a reflecting film 24 disposed on a side of the substrate 2, but does not have, in addition to the reflecting film, a reflecting member.

Second, in addition to not teaching both a reflecting member and a reflecting film, Muramatsu does not disclose or suggest a reflecting member forming part of a reflecting film, as required by independent claim 40.

Thus amended independent claim 40 is not rendered obvious by Muramatsu because the reference does not suggest the modifications that would be needed to replicate the claimed invention. In the context of obviousness rejections based upon the purported obviousness of effecting a required modification, the Federal Circuit has held that "[t]he mere fact that the prior art may be modified in [a given] manner ... does not make the modification obvious unless the prior art suggested the desirability of the modification". In re Fritch, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992). There is nothing in Muramatsu that would have suggested the structural combination of the optical microcantilever recited in amended independent claim 40.

Accordingly, applicants respectfully submit that claims 37 and 40 patentably distinguish over the prior art of record and that the claim rejection under 35 U.S.C. §103(a) should be withdrawn.

Claim 38 was rejected under 35 U.S.C. §103(a) as being unpatentable over Muramatsu in view of Niwa. Applicants respectfully traverse this rejection and submit that the combined teachings of Muramatsu and Niwa do not disclose or suggest the subject matter recited in claim 38.

Muramatsu does not disclose or suggest the subject matter recited in amended independent claim 34 as set forth above for the rejection of claims 1, 3, 4 and 24-35 under 35 U.S.C. §102(b). Claim 38 depends on and contains all of the limitations of amended independent claim 34 and, therefore, distinguishes from Muramatsu at least in the same manner as claim 34.

The secondary reference to Niwa has been cited by the Examiner for its disclosure of a reflecting film disposed on a section of a waveguide. However, Niwa does not disclose or suggest both a reflecting member and a reflecting film, and further that the reflecting member forms part of the reflecting film, as required by amended independent claim 34, from which claim 38 depends. Since Niwa does not disclose or suggest this structural feature, it does not cure the deficiency of Muramatsu. Accordingly, one ordinarily skilled

in the art would not have been led to modify the references to attain the claimed subject matter.

In view of the foregoing, applicants respectfully request that the rejection of claim 38 under 35 U.S.C. §103(a) as being unpatentable over Muramatsu in view of Niwa be withdrawn.

The amendments to the abstract and claims made herein do not raise new issues requiring further search and/or consideration. Instead, independent claims 1 and 34 have been amended to further patentably distinguish from the prior art of record by incorporating part of the subject matter of claims 4 and 35, respectively, and to recite the structural relationship between the reflecting member and the reflecting film recited in claim 36, independent claim 40 has been amended in a manner similar to claims 1 and 35, dependent claims 4, 27, 29, 31, 33 and 35 have been amended in light of the amendments to claims 1 and 35, respectively, claims 36 and 39 have been canceled, and a new abstract which more clearly reflects the invention to which the amended claims are directed has been substituted for the previously submitted abstract, thereby placing the application in condition for allowance or otherwise substantially reducing the issues which remain for appeal.

In view of the foregoing amendments and discussion,
the application is believed to be in allowable form.
Accordingly, entry of this amendment and favorable
reconsideration and allowance of the claims are most
respectfully requested.

Respectfully submitted,

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September 5, 2003

Date



ABSTRACT OF THE DISCLOSURE

An optical microcantilever has an optical waveguide for propagating light. The optical waveguide has a first side, a second side opposite to the first side, and a tip portion formed on the first side and at a free end of the optical waveguide. The tip portion has a microscopic aperture. A reflecting film is disposed on the second side of the optical waveguide. A reflecting member forms part of the reflecting film and is disposed at the free end of the optical waveguide. The reflecting member has a generally planar surface for reflecting light propagated by the optical waveguide and for guiding the reflected light towards the microscopic aperture to generate near-field light at the microscopic aperture.

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